

What is claimed is:

1. A liquid processing apparatus, in which a process liquid is supplied to a substrate for performing a liquid processing, comprising:

5           a substrate rotating device including a holder for holding a substrate and a rotating device for rotating said holder;

10           a posture changing mechanism for changing the posture of said substrate rotating device such that a state of the substrate held by said holder changes between substantially vertical and substantially horizontal;

15           a process chamber for applying said liquid processing to the substrate held substantially vertical by said holder; and

20           a position adjusting mechanism for relatively adjusting the positions of said process chamber and said holder such that said holder is housed in said process chamber.

25           2. A liquid processing apparatus according to claim 1, wherein said position adjusting mechanism moves said substrate rotating device and said posture changing mechanism simultaneously.

3. A liquid processing apparatus according to claim 1, wherein said holder holds a single substrate.

4. The liquid processing apparatus according to claim 1, wherein said process chamber is of a double

wall structure comprising an outside chamber and an inside chamber movable between the process position within said outside chamber and the retreat position outside said outside chamber.

5           5. A liquid processing apparatus according to claim 3, further comprising a container delivery section for performing the delivery of a container having a plurality of substrates housed therein substantially horizontal a predetermined distance apart from each other and a substrate transfer device for transferring the substrate in substantially a horizontal state  
10           between the container disposed in said container delivery section and said holder.

15           6. A liquid processing apparatus according to claim 5, wherein said substrate transfer devise includes a transfer arm for transferring the unprocessed substrates and another transfer arm for transferring the processed substrates.

20           7. A liquid processing apparatus according to claim 5, comprising a plurality of said process chambers and a plurality of said substrate rotating devices, said substrate transfer device including a moving mechanism for gaining access to said plural substrate rotating device.

25           8. A liquid processing apparatus according to claim 1, wherein said holder holds substantially in parallel a plurality of substrates.

9. The liquid processing apparatus according to claim 8, wherein said process chamber is of a double wall structure comprising an outside chamber and an inside chamber movable between the process position  
5 within said outside chamber and the retreat position outside said outside chamber.

10. A liquid processing apparatus according to claim 8, further comprising a container delivery section for performing the delivery of a container having a plurality of substrates housed therein substantially horizontal a predetermined distance apart from each other and a substrate transfer device for transferring the substrate in substantially a horizontal state between the container disposed in said container  
15 delivery section and said holder.

11. A liquid processing apparatus according to claim 10, wherein said substrate transfer devise includes a plurality of transfer arms for transferring the substrates housed in the container in a single  
20 operation, each of said plural arms holding a single substrate.

12. A liquid processing apparatus according to claim 11, wherein said substrate transfer devise includes a mechanism for adjusting the distance between adjacent arms of said plural transfer arms.  
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13. A liquid processing apparatus according to claim 10, wherein said holder is capable of holding the

substrates housed in two containers in a single operation.

14. A liquid processing apparatus, in which a process liquid is supplied to a substrate for performing a liquid processing, comprising:

a holder for holding substantially in parallel a plurality of substrates a predetermined distance apart from each other;

a container delivery section for delivering a container having a plurality of substrates housed therein substantially horizontal a predetermined distance apart from each other;

a substrate transfer device for transferring a plurality of substrates in a substantially horizontal state between a container disposed in said container delivery section and said holder;

a posture changing mechanism for changing the posture of said holder such that a state of the substrates held by said holder changes between substantially vertical and substantially horizontal;

a process chamber, which houses said holder, for applying said liquid processing to the substrate held substantially vertical by said holder;

a moving mechanism for sliding both said holder and said posture changing mechanism such that said holder is housed in said process chamber; and

a holder transfer/rotation driving mechanism for

transferring said holer within said process chamber and rotating said holder.

15        15. The liquid processing apparatus according to claim 14, wherein said process chamber is of a double wall structure comprising an outside chamber and an inside chamber movable between the process position within said outside chamber and the retreat position outside said outside chamber.

10        16. The liquid processing apparatus according to claim 14, wherein said substrate transfer device includes a transfer arm for transferring the unprocessed substrate and another transfer arm for transferring the processed substrate.

15        17. The liquid processing apparatus according to claim 14, wherein said substrate transfer devise includes a plurality of transfer arms for transferring the substrates housed in the container in a single operation, each of said plural arms holding a single substrate.

20        18. The liquid processing apparatus according to claim 14, wherein said container delivery section includes a plurality of stages on which the container is disposed, and said substrate transfer device includes a moving mechanism for permitting the substrate transfer  
25        device to gain access to each container disposed on said plural stages.

19. A liquid processing apparatus, in which a

process liquid is supplied to a substrate for performing a liquid processing, comprising:

a holder for holding a substrate;

a rotor for rotating said holder;

5 a process chamber, which includes a delivery port for moving said holder into and out of said process chamber and houses said holder, for applying said liquid processing to the substrate held by said holder; and

10 a lid for closing the delivery port formed in said process chamber under the state that said holder is housed in said process chamber;

wherein said holder, said rotor and said lid are formed as an integral structure.

20. The liquid processing apparatus according to  
15 claim 19, wherein said holder is housed in said process chamber with the substrate held substantially vertical.

21. The liquid processing apparatus according to  
20 claim 19, wherein said process chamber is of a double wall structure comprising a fixed outside chamber and an inside chamber slidable between the process position within said outside chamber and the retreat position outside said outside chamber.

22. The liquid processing apparatus according to  
25 claim 21, wherein said outside chamber includes a first delivery port for moving said holder into and out of said outside chamber and a first seal mechanism arranged in said first delivery port, and said inside chamber

includes a second delivery port for moving said holder into and out of said inside chamber and a second seal mechanism arranged in said second delivery port, wherein, when said holder is housed in said inside chamber, the clearance between said lid and said first delivery port is sealed by said first seal mechanism, and the clearance between said lid and said second delivery port is sealed by said second seal mechanism.

23. The liquid processing apparatus according to claim 22, wherein the inner diameter of said first delivery port is equal to the inner diameter of said second delivery port.

24. The liquid processing apparatus according to claim 19, further comprising a pivot joining said holder and said rotor, a pivot cover surrounding said pivot, and vibration suppressing means joining said pivot cover and said process chamber under the state that said holder is housed in said process chamber thereby to suppress the movement or vibration of said pivot.

25. The liquid processing apparatus according to claim 24, wherein said vibration suppressing means includes clamp levers mounted at said process chamber each capable of rotation by a predetermined angle, and engaging sections mounted on said pivot cover engaged with said clamp levers, said clamp levers and said engaging sections being arranged in two positions which are in substantially symmetry with respect to the axis

of said pivot.

26. The liquid processing apparatus according to claim 19, wherein said lid includes a liquid receptacle section for recovering the process liquid attached to said lid.

27. The liquid processing apparatus according to claim 19, wherein said lid includes a supply mechanism for supplying a predetermined cleaning liquid or a predetermined gas to said holder.

28. The liquid processing apparatus according to claim 19, further comprising:

a container delivery section for performing the delivery of a container having a plurality of substrates housed therein substantially horizontal;

a substrate transfer device for transferring a substrate in substantially a horizontal state between the container disposed in said container delivery section and said holder; and

a holder moving mechanism for moving said holder between a substrate delivery position, where delivery of the substrate is performed between said substrate transfer device and said holder and a process position where a liquid processing is applied to the substrate held by said holder.

29. The liquid processing apparatus according to claim 28, wherein said holder moving mechanism includes a posture changing mechanism for changing the posture of



said holder such that a state of the substrates held by  
said holder changes between substantially vertical and  
substantially horizontal, a lift mechanism for moving  
said holder and said posture changing mechanism in the  
5 height direction and a horizontal moving mechanism for  
moving said holder, said posture changing mechanism and  
said lift mechanism in a horizontal direction such that  
said holder is moved into and out of said process  
chamber under the state that the substrate is held  
10 substantially vertical by said holder.

30. The liquid processing apparatus according to  
claim 29, wherein said process chamber includes a  
passing position detecting sensor for detecting the  
position of said holder when said holder passes through  
15 said delivery port.

31. The liquid processing apparatus according to  
claim 30, wherein, when said passing position detecting  
sensor has detected the position where said holder is  
incapable of passing through said delivery port and is  
20 likely to collide against said process chamber, said  
horizontal moving mechanism stops the movement of said  
holder into and out of said process chamber.